

**LEPIDOPTERA REARED FROM *UROMYCLADIUM TEPPERIANUM*  
(SACC.) MCALPINE GALLS COLLECTED ON *ACACIA IMPLEXA*  
BENTH. NEAR CHAFFEY DAM, NEW SOUTH WALES**

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**Abstract**

Sixteen species of Lepidoptera were reared from *Uromycladium tepperianum* galls collected on *Acacia implexa* from slopes to the north of Chaffey Dam in New South Wales, between August 1993 and April 1997. These galls yielded 733 individuals of Lepidoptera (families Cosmopterigidae, Gelechiidae, Gracillariidae, Oecophoridae, Psychidae, Pyralidae, Tineidae and Tortricidae). Many of the Lepidopteran species in this study appear to be present all year round. Six or seven of the Lepidopteran species found in this study are similar to ones reared from *Acacia* galls in other studies.

**Introduction**

*Uromycladium tepperianum* (Sacc.) McAlpine (Uredinales: Pileolariaceae) is a gall-forming rust which has been recorded on over 100 *Acacia* species and *Paraserianthes lophantha* (Willd.) I.C.Nielsen subsp. *lophantha* in Australia (Gathe 1971, Morris 1987). The rust causes galling on stems, branches, phyllodes and reproductive parts, and witches' broom growth at the end of *Acacia implexa* Benth. branches in much the same way as it affects *Acacia saligna* (Labill.) H.L.Wendl. in south-western Australia (Morris 1987). There appear to be a number of genotypes of the rust in Australia and these appear to be restricted to particular host species (Morris 1987). For this reason a genotype of rust has been used as a biological control agent for *A. saligna* in South Africa (Morris 1991, 1997, Wood and Morris 2007), although there has been debate about whether this *Acacia* should be controlled in all situations (Selincourt 1992).

Lepidoptera have been reared from *U. tepperianum* galls in the past (New 1982; Common 1990; Bashford 2002) and it has been suggested that tunnelling by Lepidoptera may prematurely kill galls (New 1982). Extensive studies on moths from *U. tepperianum* galls were conducted by New (1982) and Bashford (2002). New (1982) reared 2549 individuals, of seven moth species, from galls on *Acacia decurrens* Willd. collected at La Trobe University, Victoria. Bashford (2002) reared 4366 individuals, of nine moth species, from galls on *Acacia dealbata* Link collected at a number of sites in Tasmania. Moth species found by New (1982) were *Polysoma eumetalla* (Meyrick) (as *Acrocercops eumetalla* (Meyrick)), *Stathmopoda callichrysa* Lower, *S. cephalaea* Meyrick, *Gauna aegusalis* (Walker), an unidentified species of pyralid (Pyralidae, Phycitinae), *Erechthias* sp. nr *mystacinella* (as *Comodica mystacinella* (Walker)) and *Holocola* sp. (*triangulana* group) (as *Eucosma triangulana* (Meyrick)). Moth species found by Bashford (2002) were mostly the same. He found a

*Macrobathra* sp., *P. eumetalla*, *Stathmopoda chalcotypa* Meyrick, *S. cephalaea*, *G. aegusalis*, *Erechthias ancistrosema* Turner, *E. sp. nr mystacinella* (as *E. mystacinella*), *Opogona comptella* (Walker) and *H. sp. triangulana* group (as *H. triangulana*). Another moth species reared from *Uromycladium* galls is *Conopomorpha helioplæ* Meyrick (as *Acrocercops helioplæ* (Meyrick)) (Common 1990).

In this paper we enumerate moths reared from *U. tepperianum* galls (Fig. 1) collected on *A. implexa* Benth., near Chaffey Dam, between August 1993 and April 1997.



**Fig. 1.** *Uromycladium tepperianum* galls on *Acacia implexa*, near Chaffey Dam, New South Wales.

### Material and methods

Galls were collected from *A. implexa* trees on slopes of a ridge to the north of Chaffey Dam (31° 20' S 151° 08' E). Collections were made in the middle of each month from August 1993 to August 1994, then at 3 monthly intervals until July 1995 and in April 1997. Varying numbers and sizes of galls were held in clear plastic containers. Ventilation of containers was via a large hole, covered

by fine metal mesh, in the flexible plastic lids of the containers. Containers were held for two months in a room maintained at close to 25°C. All Lepidoptera emerging over this period were identified and numbers of each species recorded. During the last two weeks that the galls were held few moths emerged. After two months gall remains were dried and weighed and total dry weights of galls recorded. Holding larger numbers of galls in individual containers, and recording gall ages, may have been more informative but was beyond the scope of this study.

Voucher specimens of all moths have been lodged at the Australian National Insect Collection, CSIRO Entomology, Canberra, and of *A. implexa* with *U. tepperianum* galls at the NSW Department of Primary Industries Plant Pathogen Herbarium at Orange and at various herbaria (the National Herbarium of New South Wales, Sydney; Australian Botanic Gardens Herbarium, Canberra and the National Herbarium of Victoria, Melbourne). Duplicates of most moth species have also been lodged at the NSW Department of Primary Industries insect collections at Orange and Tamworth. Moth nomenclature in this paper follows Nielsen *et al.* (1996).

## Results

Sixteen species of Lepidoptera were reared from galls. These are listed in Table 1 and 2. There are two *Macrobathra* species (Cosmopterigidae, Cosmopteriginae), one in which males have black sex scales on a white background (*Macrobathra* sp. 1 in this paper) and another without such male sex scales (*Macrobathra* sp. 2 in this paper). A number of parasitoids were reared from galls but these were not retained. Numbers of moths reared from galls therefore only reflects adult emergence and not the number of eggs and larvae of moths present on and in galls.

Numbers of each moth species varied considerably over time and some species were only collected on a few occasions (Table 1). Collections made in the same month but in different years show a lot of variation in proportions of different moth species present.

A comparison between studies by New (1982) and Bashford (2002) and this study is shown in Table 2.

## Discussion

Although fewer moths were reared from galls in this study (733 individuals) compared with those of New (1982) (2549 individuals) and Bashford (2002) (4366 individuals) more species were found and the proportions of various species were markedly different. This study was undertaken more than 700 km north of that conducted by New (1982) and even further north of that conducted by Bashford (2002), and the gall host was also different. The genotypes of the rust in all studies are also likely to be different, as Morris (1987) showed that genotypes of the rust appear to be adapted to particular host species. Latitude, climate, habitat, rust genotype, gall size and

**Table 1.** Number of Lepidoptera reared per 100 gm of *U. tepperianum* galls from *A. implexa* (and total number of moths) collected near Chaffey Dam, New South Wales.

Family Genus & species	1993					1994
	Aug	Sep	Oct	Nov	Dec	Jan
<b>Cosmopterigidae</b>						
<i>?Leptozestis</i> sp.						
<i>Macrobathra</i> sp. 1 <sup>1</sup>	0.8 (1)	0.4 (1)	0.9 (3)	1.0 (4)		
<i>Macrobathra</i> sp. 2 <sup>2</sup>	1.6 (2)		0.3 (1)		0.8 (3)	0.2 (1)
Unknown sp.	4.8 (6)	0.4 (1)	0.9 (3)	0.5 (2)	0.3 (1)	0.5 (3)
<b>Gelechiidae</b>						
<i>Anarsia</i> sp.	0.8 (1)		0.6 (2)	0.7 (3)		0.4 (2)
<b>Gracillariidae</b>						
<i>Polysoma eumetalla</i>			0.3 (1)			
<b>Oecophoridae</b>						
<i>Lichenaula undulatella</i>						
<i>Placosma resumptella</i>		0.4 (1)			0.3 (1)	
<i>Stathmopoda callichrysa</i>	0.8 (1)	0.4 (1)	0.3 (1)	0.7 (3)	2.2 (8)	
Unknown Oecophorinae species						
<b>Psychidae</b>						
Unknown species						
<b>Pyralidae</b>						
<i>Assara proleuca</i>						
<i>Gauna aegusalis</i>				1.7 (7)	0.8 (3)	
<b>Tineidae</b>						
<i>Erechthias</i> sp. nr <i>mystacinella</i>	5.6 (7)	2.1 (5)	0.6 (2)	3.6 (15)	0.6 (2)	
<b>Tortricidae</b>						
<i>Holocola</i> sp. ( <i>triangulana</i> group)	3.2 (4)	0.4 (1)	0.3 (1)	2.9 (12)	2.2 (8)	0.2 (1)
<i>Zomariana doxasticana</i>				0.2 (1)	0.3 (1)	
Dry weight of gall remains (gm)	124	242	340	420	363	570

**Table 1.** continued

1994								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Oct
								0.1 (1)
								0.1 (1)
0.2 (1)	0.2 (1)	0.3 (1)	0.2 (1)			0.1 (1)		1.5 (2)
0.5 (3)	0.6 (3)		0.2 (1)	0.5 (2)	0.6 (4)	0.9 (7)	1.6 (22)	0.8 (11)
0.4 (2)	0.2 (1)	0.5 (2)	0.7 (3)	1.3 (5)	3 (21)		0.1 (1)	
			0.2 (1)			0.1 (1)		
							0.1 (1)	1.5 (2)
	0.2 (1)		0.5 (2)	1.0 (4)	1.2 (8)	0.9 (7)	2.5 (34)	1.6 (21)
	0.2 (1)							
			1.8 (8)		0.9 (6)		0.2 (3)	0.2 (3)
	0.2 (1)							
	0.4 (2)	0.5 (2)	1.4 (6)		0.7 (5)	1.3 (10)	1.9 (26)	0.8 (10)
0.2 (1)	0.2 (1)	0.3 (1)	0.2 (1)	0.5 (2)	0.5 (3)	1.5 (11)	0.2 (3)	0.1 (1)
570	487	376	441	394	694	748	1357	1311



Table 1. continued

Family <i>Genus &amp; species</i>	1995		1997	
	Jan	Apr	Jan	Apr
<b>Cosmopterigidae</b>				
<i>?Leptozestis</i> sp.				
<i>Macrobathra</i> sp. 1 <sup>1</sup>				
<i>Macrobathra</i> sp. 2 <sup>2</sup>	0.3		0.9	0.1
	(3)		(13)	(1)
Unknown sp.	0.6		1.1	
	(6)		(17)	
<b>Gelechiidae</b>				
<i>Anarsia</i> sp.	0.8	0.1	1.5	0.8
	(8)	(1)	(22)	(11)
<b>Gracillariidae</b>				
<i>Polysoma eumetalla</i>	0.1		1.5	0.1
	(1)		(22)	(2)
<b>Oecophoridae</b>				
<i>Lichenaula undulatella</i>			0.1	
			(1)	
<i>Placosma resumptella</i>				
<i>Stathmopoda callichrysa</i>	1.1		1.4	0.2
	(11)		(21)	(3)
Unknown Oecophorinae species			0.1	
			(2)	
<b>Psychidae</b>				
Unknown species				
<b>Pyalidae</b>				
<i>Assara proleuca</i>	0.5		0.3	0.1
	(5)		(4)	(2)
<i>Gauna aegusalis</i>	1.1		0.1	
	(11)		(1)	
<b>Tineidae</b>				
<i>Erechthias</i> sp. nr	1.6	0.1	0.6	8.4
<i>mystacinella</i>	(16)	(2)	(9)	(117)
<b>Tortricidae</b>				
<i>Holocola</i> sp. ( <i>triangulana</i>	0.2		0.5	0.4
group)	(2)		(7)	(6)
<i>Zomariana doxasticana</i>				
Dry weight of gall remains	997	1362	1500	1392
(gm)				

<sup>1</sup> Male hind wing with black sex scales on white background; larger species than *Macrobathra* sp. 2 (wing length: 0.55-0.9 cm).

<sup>2</sup> Male hind wing without black sex scales; smaller species than *Macrobathra* sp. 1 (wing length: 0.4-0.45 cm).

**Table 2.** A comparison of the number and percentage of moth species reared from *U. tepperianum* galls collected on *A. implexa* near Chaffey Dam, New South Wales, *A. decurrens* at La Trobe University, Bundoora, Victoria and *A. dealbata* in Tasmania.

Family Genus & species	Chaffey Dam		La Trobe University		Tasmania	
	Total	%	Total	%	Total	%
<b>Cosmopterigidae</b>						
? <i>Leptozestis</i> sp.	1	0.1				
<i>Macrobathra</i> sp. 1 <sup>1</sup>	10	1.4				
<i>Macrobathra</i> sp. 2 <sup>2</sup>	30	4.1				
<i>Macrobathra</i> sp. (Tasmania)					3	0.1
Unknown sp.	89	12.1				
<b>Gelechiidae</b>						
<i>Anarsia</i> sp.	83	11.3				
<b>Gracillariidae</b>						
<i>Polysoma eumetalla</i>	28	3.8	155	6.1	44	1.0
<b>Oecophoridae</b>						
<i>Lichenaula undulatella</i>	4	0.5				
<i>Placosma resumptella</i>	2	0.3				
<i>Stathmopoda callichrysa</i>	126	17.2	11	0.4		
<i>S. chalcotypa</i>					3	0.1
<i>S. cephalaea</i>			1042	40.9	1285	29.4
Unknown Oecophorinac sp.	2	0.3				
<b>Psychidae</b>						
Unknown species	1	0.1				
<b>Pyalidae</b>						
<i>Assara proleuca</i>	31	4.2	61	2.4		
<i>Gauna aegusalis</i>	23	3.1	2	0.1	9	0.2
<b>Tineidae</b>						
<i>Erechthias ancistrosema</i>					12	0.3
<i>Erechthias</i> sp. nr <i>mystacinella</i> <sup>3</sup>	236	32.2	384	15.1	2487	57.0
<i>Opogona comptella</i>					5	0.1
<b>Tortricidae</b>						
<i>Holocola</i> sp. ( <i>triangulana</i> group) <sup>4</sup>	65	8.9	894	35.1	518	11.9
<i>Zomariana doxastiana</i>	2	0.3				
<b>TOTAL</b>	<b>733</b>		<b>2549</b>		<b>4366</b>	

<sup>1</sup> Male hind wing with black sex scales on white background; larger species than *Macrobathra* sp. 2 (**wing length: 0.55-0.9 cm**).

<sup>2</sup> Male hind wing without black sex scales; smaller species than *Macrobathra* sp. 1 (**wing length: 0.4-0.45 cm**).

<sup>3</sup> Assuming that *Erechthias* sp. nr. *mystacinella* of this study is the same as *Erechthias mystacinella* of Bashford (2002).

<sup>4</sup> Assuming that *Holocola* sp. (*triangulana* group) of this study is the same as *Holocola triangulana* of Bashford (2002).

abundance, and *Acacia* species and abundance, may all play a role in differences between the composition and number of species found in this study and the Victorian and Tasmanian studies.

The most common species in this study were *Erechthias* sp. nr *mystacinella* (32.2%), *S. callichrysa* (17.2%), an unknown cosmopterigid (12.1%) and *Anarsia* sp. (11.3%). A comparison of the species found in this study and in the Victorian (New 1982) and Tasmanian studies (Bashford 2002) is shown in Table 2. The most common species found in the Victorian study were *S. cephalaea* (40.9%), which was not encountered near Chaffey Dam, *Holocola* sp. (*triangulana* group) (35.1%) and *Erechthias* sp. nr *mystacinella* (15.1%). The most common species found in the Tasmanian study were *E.* sp. nr *mystacinella* (57.0%), *S. cephalaea* (29.4%) and *H.* sp. (*triangulana* group) (11.9%). Interestingly the three most common species were the same in Victoria and Tasmania. Ten of the species near Chaffey Dam, *?Leptozeis* sp., two species of *Macrobathra*, the unknown cosmopterigid, *Anarsia* sp., *Lichenaula undulatella* (Walker) (Oecophoridae, Xyloryctinae), *Placosma resumptella* (Walker) (Oecophoridae, Oecophorinae), an unknown oecophorid, an unknown psychid and *Z. doxasticana* were not encountered in the Victorian study or the Tasmanian study although the *Macrobathra* sp. recorded in the Tasmanian study may be the same as one of those found in this study. Prior to this study the host of *P. resumptella* was not known (Common 1994). Other moths reared from *Uromycladum* galls, in this case from *Acacia pyrifolia* DC. from the Pilbara (Western Australia), are *Cryptophlebia* sp. nr *ombrodelta* (Tortricidae) and *Stathmopoda* sp. nr *callichrysa* (Oecophoridae) (E.D. Edwards unpublished). Another *Anarsia* sp., *Anarsia trichodeta* Meyrick has been recorded tunneling in galls on *Acacia harpophylla* F.Muell. ex Benth. in Queensland, and joining phyllodes of *Acacia ligulata* A.Cunn. ex Benth. in Western Australia (Common 1990). The galls referred to on *A. harpophylla* may have been *U. tepperianum* galls but prior to this study there was no definite reference to *Anarsia* species being reared from *U. tepperianum* galls.

New (1982) pointed out that numbers of moths per gall varied considerably and from the large differences in numbers of moths, and the proportions of various species, reared from collections often only one month apart, and for the same month in different years, this would appear to be the case in this study also. The minimum number of moth species reared from galls during any one month was two and the maximum eleven. In only five cases (out of 18) did a single moth species account for more than 40% of the number of moths reared. In April 1997 *Erechthias* sp. nr *mystacinella* accounted for 82%, in September 1993 *Erechthias* sp. nr *mystacinella* accounted for 50%, in January 1994 an unknown cosmopterigid accounted for 43% and in June 1994 *Anarsia* sp. accounted for 44.7% of the total number of Lepidoptera reared for the respective months. On the other occasion, April 1995, only three moths were reared from galls and two were of the same species. This contrasts with Victorian and Tasmanian studies where one moth always accounted for more than 40% of the moths reared.



Many of the moth species in this study appear to be present all year round. This study would suggest that *Macrobathra* sp. 1 is present in collections from late winter to the end of spring. However, as the number of moths reared from galls is low any inference on seasonality should be made with caution.

New (1982) observed that Lepidoptera were the main insects present in galls. Bashford (2002) did not comment on frequencies of Lepidoptera relative to insects of other orders. The study at Chaffey Dam indicated that in this area large numbers of Curculionoidea could also be reared from galls, about one for every two Lepidoptera reared from galls (J.R.Hosking unpublished data).

A number of the *A. implexa* trees in the study area were dead and most of these had large old *U. tepperianum* galls present on them. Damage to galls by tunneling insects may reduce the life of galls but galls still appeared to have an adverse effect on *A. implexa* in this area. A number of *A. implexa* trees with large galls died during the study.

Some of the moth species from this study have only been recorded from *U. tepperianum* galls but studies have not been made in enough detail to know whether some of these insects are restricted to *U. tepperianum* galls. Of the moth species recorded from *U. tepperianum* *P. eumetalla*, *E. sp. nr. mystacinella* [as *E. mustacinella*], *S. cephalaea*, *H. sp. triangulana* group (as *H. triangulana*), *Macrobathra* sp., *G. aegusalis* and *O. comptella* have also been recorded from galls formed by *Trichilogaster acaciaelongifoliae* (Froggatt) (Hymenoptera) on *Acacia longifolia* subsp. *sophorae* (Labill.) Court in Tasmania (Bashford 2004) and *E. sp. nr. mystacinella* [as *E. mustacinella*], *O. comptella*, *P. eumetalla*, *S. chalcotypa* and *Macrobathra* sp. from galls formed by *Cecidomyia acaciaelongifoliae* Skuse (Diptera) on *Acacia melanoxylon* R.Br. in Tasmania (Bashford 2006).

Similar assemblages of moths inhabit galls induced by the host specific rust fungus *Ravenelia macowaniana* Pазsche (Uredinales: Pileolariaceae) on *Vachellia karroo* (Hayne) Banfi & Galasso (as *Acacia karroo* Hayne) in South Africa (McGeoch 1993, McGeoch and Krüger 1994). Microlepidopteran larvae found in the galls were from the families Cosmopterigidae, Gelechiidae, Noctuidae, Oecophoridae, Pyralidae, Tineidae and Tortricidae. All of these families, with the exception of Noctuidae, were present in galls from near Chaffey Dam. No moth species were the same in Australia and South Africa but the genus *Anarsia* occurred in galls in both countries. Investigation of *U. tepperianum* galls in South Africa may show that a number of Lepidoptera found on *R. macowaniana* have adapted to *U. tepperianum* galls.

A number of questions arise from a comparison between this study and those of New (1982) and Bashford (2002). Are the differences in the moth species present, and their frequency, a reflection of the latitude, climate, habitat, rust genotype or the *Acacia* species or a combination of these? Further studies are needed to resolve these questions.

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